

Calculus with Elementary Functions

Description of the Examination

The Calculus with Elementary Functions exam covers skills and concepts usually taught in a one-year college course in calculus with elementary functions. The major emphasis of the exam is divided equally between topics from differential and integral calculus. Properties of algebraic, trigonometric, exponential, and logarithmic functions as well as limits are also measured. The exam is primarily concerned with an understanding of calculus and experience with its methods and applications. Knowledge of preparatory mathematics, including algebra, plane and solid geometry, trigonometry, and analytic geometry, is assumed. Students are permitted, but not required, to use a scientific calculator (nongraphing, nonprogrammable) during the exam.

The exam includes approximately 45 multiple-choice questions to be answered in two separately timed 45-minute sections.

Knowledge and Skills Required

The subject matter of the Calculus with Elementary Functions exam is drawn from the following topics.

Approximate Percent of Examination

10%	Elementary Functions (algebraic, trigonometric, exponential, and logarithmic)
45%	Differential Calculus
45%	Integral Calculus

Approximate Percent of Examination 10% Elementary Functions (algebraic, trigonometric, exponential, and logarithmic)

Properties of functions

- Definition, domain, and range

- Sum, product, quotient, and composition

- Absolute value, e.g., and

- Inverse

- Odd and even

- Periodicity

- Graphs; symmetry and asymptotes

- Zeros of a function

Limits

- Statement of properties, e.g., limit of a constant, sum, product, and quotient

- The number e such that and

- Limits that involve infinity, e.g., is nonexistent and

- Continuity

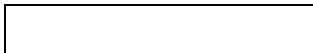
45% Differential Calculus

- The derivative

- Definitions of the derivative; e.g.,
- Derivatives of elementary functions
- Derivatives of sum, product, quotient (including $\tan x$ and $\cot x$)
- Derivative of a composite function (chain rule); e.g., $\sin(ax + b)$, ae^{kx} , $\ln(kx)$
- Derivative of an implicitly defined function
- Derivative of the inverse of a function (including $\arcsin x$ and $\arctan x$)
- Logarithmic differentiation
- Derivatives of higher order
- Statement (without proof) of the Mean Value Theorem; applications and graphical illustrations
- Relation between differentiability and continuity
- Use of L'Hôpital's rule (quotient and indeterminate forms)
- Applications of the derivative
 - Slope of a curve; tangent and normal lines to a curve
 - Curve sketching: increasing and decreasing functions; relative and absolute maximum and minimum points; concavity; points of inflection
 - Extreme value problems
 - Velocity and acceleration of a particle moving along a line
 - Average and instantaneous rates of change
 - Related rates of change
 - Newton's method

45% Integral Calculus

- Antiderivatives
- Applications of antiderivatives
 - Distance and velocity from acceleration with initial conditions
 - Solutions of $y' = ky$ and applications to growth and decay
 - Solutions of $f(y) dy = g(x) dx$ (variables separable)
- Techniques of integration
 - Basic integration formulas



- Integration by substitution (use of identities, change of variable)
- Simple integration by parts, such as

- The definite integral
 - Concept of the definite integral as an area
 - Approximations to the definite integral using rectangles or trapezoids
 - Definition of the definite integral as the limit of a sum
 - Properties of the definite integral



- The fundamental theorem -
- Applications of the integral
 - Average value of a function on an interval
 - Area between curves

Volume of a solid of revolution
(disc, washer, and shell methods) about the x- and
y-axes or lines parallel to the axes

Study Resources

To prepare for the Calculus exam, a candidate is advised to study one or more introductory college level calculus textbooks, which can be found in most college bookstores. When selecting a textbook, check the table of contents against the "Knowledge and Skills Required" section. In addition, the Barron's book provides helpful test preparation suggestions, and the Schaum Outline provides a condensed version of the important topics usually covered in a college calculus course. Both of these books contain many sample problems; many of those in the Barron's book are taken from old forms of Advanced Placement and CLEP exams.